SRI LANKA STANDARD 560 : 1982

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METHOD FOR THE DETERMINATION OF STRENGTH PARAMETERS OF YARNS BY SKEIN METHOD

BUREAU OF CEYLON STANDARDS

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(Superseding CS 24:1968)

Gr. 5

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Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all [redacted]y provisions of a contract.

SRI LANKA STANDARD

METHOD FOR THE DETERMINATION OF STRENGTH PARAMETERS OF YARNS BY SKEIN METHOD

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Bureau of Ceylon Standards on 1982-05-24 after the draft, finalized by the Drafting Committee on Test methods for textiles had been approved by the Textiles Divisional Committee.

This standard supersedes CS 24 : 1968 Determination of lea strength and lea count of spun yarns, which covered the strength parameters in the indirect system only. The scope of the present standard had been widened to include the strength parameters in the direct system also, namely, the skein breaking tenacity and the yarn strength index.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

In the preparation of this standard, the assistance obtained from the publications of the Indian Standards Institution and the Annual Book of the American Society for Testing and Materials(ASTM) Standards is gratefully acknowledged.

1 SCOPE

This standard describes a method for the determination of the breaking strength of yarn in skein form. Equations are also provided in this to calculate the skein breaking tenacity, yarn strength index and count strength product.

This method is not suitable for yarns that stretch more than 5 per cent when the force is increased from 2.5 mN/tex to 7.5 mN/tex or 0.25 cN/tex to 0.75 cN/tex.

2 REFERENCES

CS 16 Standard atmospheres for conditioning and testing textiles

CS 20 Determination of the size of yarns

CS 102 Presentation of numerical values.

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply:

3.1 breaking strength : The maximum force applied to a specimen in a tensile test carried to rupture. It is commonly expressed as grams-force (gf), kilograms-force (kgf), newtons (N), millinewtons (mN), centinewtons (cN) or as pounds-force (lbf).

3.2 skein : A continuous strand of yarn in the form of a flexible coil having a large circumference in proportion to its thickness. Skein of 120 yds made on 1.5 yd girth reel is in use in cotton count system and is called 'lea'; while skein of 100 m or 50 m made on 1 m girth reel are in use in tex system.

3.3 skein breaking tenacity (SBT) : The breaking strength, in grams of a 50 m skein divided by the linear density of the unstrained yarn in tex and the number of strands in the skein, that is; 100. It is expressed in grams-force per tex (gf/tex), centinewtons per tex (cN/tex) or in millinewtons per tex (mN/tex).

3.4 yarn strength index (YSI) : The breaking strength in grams of a 100 m skein divided by the linear density of the unstrained yarn in tex.

3.5 count strength product (CSP) or skein breaking factor (SBF) : The product of the breaking strength in pounds of a lea of yarn and its count (cotton count).

4 APPARATUS

4.1 *Wrap-reel*

A hand or motor-driven reel having a perimeter of 1 m or 1.5 yd. The reel shall be fitted with a traversing mechanism that will minimize bunching the yarn on the reel and with an indicator of the length wound.

4.2 *A direct reading count balance, or other balance,* capable of giving readings accurate to ± 0.25 per cent.

4.3 *A skein breaking tensile testing machine,* working on constant-rate of traverse (CRT) principle. The rate of traverse of the moving clamp shall be 300 ± 10 mm/min of capable of operating at such a rate that the skein is broken in an average time of 20 ± 3 from the start of application of tension to the skein.

4.3.1 The machine shall be provided with the following arrangements:

a) Two pulleys or hooks for holding the skein with sufficient space to allow the even distribution of threads without much overlapping.

b) Means for adjusting distance between the pulleys or hooks.

c) A scale or dial or autograph recording chart graduated so as to give force in kilograms or in pounds.

NOTE - In tensile testing equipment accommodating the skeins of one metre girth the dial is calibrated in kilograms and in the equipment that accommodates skeins of 1.5 yd girth the dial is usually calibrated in pounds. However, there are certain tensile testing machines with the scales calibrated both in pounds and kilograms, and the facilities are provided to accommodate both types of skeins of 1.0 m girth and of 1.5 yd girth.

5 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

5.1 The samples shall be conditioned to moisture equilibrium in standard atmosphere of 65 ± 2 per cent relative humidity and the temperature of 27 ± 2 °C (Refer CS 16).

6 SAMPLING

Twenty packages from each of which a complete skein may be withdrawn. If twenty packages are not available a smaller multiple of four packages may be used, provided that in taking twenty skeins equal numbers can be taken from each package of group 4, for example : 8 packages, 3 leas from each of 4 packages and 2 leas from each of the other 4 packages.

7 PROCEDURE

The yarn packages shall be conditioned and the tests carried out in the atmosphere for testing.

The package shall be so mounted that the yarn may be withdrawn from it either over-end or sideways, whichever is the normal manner. The yarn shall then be passed over guide bars to the wrap reel in such a way that the tension in the running yarn is sufficient to straighten it but not high enough to cause serious stretching (Refer also CS 20).

A skein of yarn shall be wound at a steady speed and the two ends of yarn knotted together, care being taken that the knotted turn is similar in tension to the others. The skein shall then be removed from the wrap reel as a flat tape and transferred to the hooks of the strength tester, care being taken that the turns are not bunched together and that the band of threads is not twisted.

The bottom hook of the testing machine shall be set in motion and when the skein is completely broken the dial reading of the machine shall be read and recorded. The broken skein shall then be removed from the hooks and weighed on the direct reading count balance or on any analytical balance if a direct reading balance is not available. Each of the twenty skeins shall be tested in this way, except that if an analytical balance is being used for weighing and it is more convenient to retain the broken leas in numbered packets and to weigh them after all the strength tests have been made.

8 CALCULATIONS

8.1 Calculate the average breaking strength and average linear density of all the observations taken.

8.1.1 Calculate the coefficient of variation (CV) of all the breaking strength values taken.

8.2 Tex system

8.2.1 *Skein breaking tenacity (SBT)*

Calculate the tenacity or tenacity of yarn corrected to nominal linear density, correct to one decimal place, by the following formulae:

a) SBT in grams per tex $= \dfrac{L_2 \times 1000}{t \times 2 \times 50} = \dfrac{L_2 \times 10}{t}$

b) SBT (corrected) $= \dfrac{L_{2c} \times 10}{t'}$

where

L_2 = average breaking strength of 50 m skein, in kg;

t = average linear density of yarn, in tex;

L_{2c} = average breaking strength of 50 m skein, in kg, corrected to nominal linear density (see Appendix A); and

t' = nominal linear density, in tex.

8.2.2 *Yarn strength index (YSI)*

Calculate the yarn strength index or yarn strength index corrected to nominal linear density by the following formulae. The result should be reported to an integral value rounded off in accordance with CS 102.

a) $$YSI = \frac{L_3 \times 1000}{t}$$

b) $$YSI\ (corrected) = \frac{L_{3c} \times 1000}{t'}$$

where,

L_3 = average breaking strength of 100 m skein, in kg;

t = average linear density of yarn, in tex;

L_{3c} = average breaking strength of 100 m skein, in kg, corrected to nominal linear density (see Appendix A); and

t' = nominal linear density, in tex.

8.3 Cotton count system

8.3.1 *Count strength product (CSP) or skein breaking factor (SBF)*

Calculate the count strength product or count strength product corrected to nominal count, by the following formulae. The result should be reported to an integral value rounded off in accordance with CS 102.

a) $$CSP = L_1 \times N_e$$

b) $$CSP\ (corrected) = L_{1c} \times N'_e$$

where,

L_1 = average breaking strength, in pounds-force, of the lea;

L_{1c} = average breaking strength, in pounds-force, corrected to nominal count (see Appendix A); and

N'_e = nominal cotton count.

9 REPORT

9.1 The report shall include the following information:

a) Type of material;

b) Number of specimens tested;

c) Actual count;

d) Breaking strength of skein (109.73 m (120 yds), 50 m or 100 m); or breaking strength of skein corrected to nominal count/linear density;

e) Coefficient of variation (CV) of breaking strength values;

f) Skein breaking tenacity (SBT)/Skein breaking tenacity (SBT) corrected to nominal linear density (report to an integral value rounded off in accordance with CS 102); or

Yarn strength index (YSI)/Yarn strength index (YSI) corrected to nominal linear density (report to an integral value rounded off in accordance with CS 102); or

Count strength product (CSP)/Count strength product (CSP) corrected to nominal count (report to an integral value rounded off in accordance with CS 102).

APPENDIX A

CORRECTION FOR NOMINAL YARN COUNT/LINEAR DENSITY

A.1 To obtain the average breaking strength corrected to nominal yarn count or linear density, use the following procedure.

A.1.1 Arrange the values of linear density and the corresponding breaking strength of all observations as obtained in 7, in the ascending order of the yarn count/linear density.

A.1.2 Find the average linear density and the average breaking strength of:

	Indirect system			Direct system	
				50 m skein	100 m skein
The first three skeins	N_{e1}	L'_1	t_1	L'_2	L'_3
The last three skeins	N_{e2}	L''_1	t_2	L''_2	L''_3
All the skeins	N_e	L_1	t	L_2	L_3

A.1.3 Calculations

a) $$K_1 = \frac{L'_1 - L''_1}{N_{e2} - N_{e1}}$$

b) $$K_2 \text{ (50 m skein)} = \frac{L''_2 - L'_2}{1/t_1 - 1/t_2}$$

c) $$K_3 \text{ (100 m skein)} = \frac{L''_3 - L'_3}{1/t_1 - 1/t_2}$$

A.1.4 Find the average breaking strength corrected (L_{1c}, L_{2c} or L_{3c}) to nominal count N'_e or to nominal linear density t', by the following formulae:

a) $L_{1c} = L_1 - K_1 (N'_e - N_e)$

b) $L_{2c} = L_2 - K_2 (1/t - 1/t')$

c) $L_{3c} = L_3 - K_3 (1/t - 1/t')$

BUREAU OF CEYLON STANDARDS

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The principal objects of the Bureau as set out in the Act are to promote standards in industry and commerce, prepare national Standards Specifications and Codes of Practice and operate a Standardization Marks Scheme and provide testing facilities, as the need arises.

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The detailed preparation of Standard Specifications is done by Drafting Committees composed of experts in each particular field assisted by permanent officers of the Bureau. These Committees are appointed by the Divisional Committees, which are appointed by the Council. All members of the Drafting and Divisional Committees render their services in an honorary capacity. In preparing the Standard Specifications, the Bureau endeavours to ensure adequate representation of all view points.

In the international field the Bureau represents Sri Lanka in the International Organization for Standardization (ISO) and will participate in such fields of Standardization as are of special interest to Sri Lanka.

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